# A Stress Management Expert System for Cancer Prevention

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## Abbreviated Abstract

Stage-matched interventions for stress management that are interactive and individualized, and are delivered proactively to entire populations can have unprecedented impacts. Computer-based expert systems linked to self-help manuals can be as effective as counselors, but at much lower cost and greater accessibility. Stress is an important cause of cancer and other chronic and acute diseases and is one of the most costly behaviors in terms of health care, job performance, and disability. Fifty-million Americans do not practice effective stress management. Existing programs are action oriented and are designed for the 30% of populations who are prepared to take action. Stage-matched programs can meet the needs of all the 45% in the Pre-contemplation stage and the 25% in the Contemplation stage. Phase I of this Fast-Track research demonstrated the feasibility of recruiting 70% of at-risk populations and the acceptability of the expert system interventions. Phase II completed recruitment of 1,200 participants randomly assigned to treatment or control and can demonstrated efficacy of these interventions over 6 months. Follow-up over 18 months showed increasing impact long after the intervention. Effective and cost-effective stress management systems can be broadly disseminated with consistent quality and user-friendly acceptability.

## Primary Investigator

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Kerry E. Evers, Ph.D. is Director of Health Behavior Change Projects at Pro-Change Behavior Systems, Inc. She received her Ph.D. in Psychology from the University of Rhode Island in 1998. She began her work with the TTM as a Research Assistant at the Cancer Prevention Research Center in 1994. She has been directly involved in the development of interactive, multimedia expert system interventions for a variety of health behaviors. In addition, she has developed study protocols, conducted measurement development, data management and analysis for these intervention programs. For Pro-Change, she was the principal investigator on a Fast-Track SBIR funded through the National Cancer Institute that developed an expert system intervention for stress management. Successful 18 month outcomes from this randomized clinical trial have led to the transfer of the print based stress management program to the Internet for use by employers, health care providers and disease management companies. In addition, Dr. Evers leads a team developing behavior programs for a large

disease management company. She also led a team that developed computerized, multimedia, expert systems for use in Elementary, Middle and High schools to decrease bullying and prevent alcohol, tobacco and drug use, as well as interventions for youth in a variety of behavioral areas in several European Countries. She led a project contracted by the Robert Wood Johnson Foundation examining the impact of health on the Internet, including the development of screening criteria, evaluation of close to 300 Internet based health behavior change programs, and published the report "Impacts On Health Behavior Change Of Health.Com Programs". Dr. Evers joined Pro-Change Behavior Systems in March 1997.

## Research Team & Affiliations

Pro-Change Behavior Systems, Inc. :Janice M. Prochaska, Ph.D., President & CEO; Leanne Mauriello, Ph.D.; Janet Johnson, Ph.D.; Julie Padula.
Cancer Prevention Research Center at the University of Rhode Island
James O. Prochaska, Ph.D., consultant and Wayne Velicier, Ph.D., consultant

## Total Budget

$796,006

## Research Objectives

Aim 1: To complete development of a first generation computerized stage-matched expert system intervention for stress management that will deliver a normative intervention report and two normative and ipsative intervention reports that will be appropriate for an at risk adult population.
Aim 2: To complete the proactive recruitment of a high proportion of subjects from a targeted population of adults who are not practicing stress management.
Aim 3: To complete the delivery of the full expert system intervention for stress management to a targeted population of adults who are not practicing stress management.
Aim 4: To demonstrate a high participation rate in the intervention for the complete longitudinal intervention composed of three stage-matched normative and ipsative expert system progress reports plus stage-matched manuals for stress management.
Aim 5: To demonstrate the efficacy of the computerized stage-matched expert system intervention for stress management.
Aim 6: To demonstrate the potential population impact of the computerized expert system intervention for stress management based on a high participation rate and a significant efficacy rate.
Aim 7: To prevent relapse in those individuals who start to practice daily stress management.
Aim 8: To demonstrate that the efficacy of the computerized expert system increases over long-term follow-ups.
Aim 9: To evaluate the effects of the stress management system on job satisfaction and job performance.

## Theory/Hypothesis

This project developed a stress management expert system intervention program based on the Transtheoretical Mode of Behavior Change (TTM) that provided individualized, stage-matched, feedback to participants at three intervention time points. In addition, participants received a stage based self-help manual for stress management to which the feedback reports referred the participants

for more guidance. The study evaluated the hypothesis that the TTM best practice of three tailored communications would be more effective than a control condition with increasing the complex target of effective stress management.

## Experimental Design

The study incorporated a 2 X 4 factorial repeated measures design. The treatment group and control group were assessed on four occasions at six-month intervals (0, 6, 12, and 18 months). The control group only received the same assessment as the treatment group at these time points. In sum, the treatment group received a total of three computerized expert system intervention reports at baseline, three months and six months. Both the treatment and control group received follow-up assessment at 12 and 18- month time points.

## Final Sample Size & Study Demographics

A national sample of 1,361 adults was proactively recruited for participation in this clinical trial. The only eligibility requirements were that the individuals were over the age of 18, English speaking and were not currently practicing effective stress management. Through a process of proactive mail and telephone calls, a greater than 70% recruitment rate was attained. Participants represented 48 states. Only those participants who identified at baseline as being in a pre-action stage for practicing stress management (not currently practicing stress management) were included in the outcome study (N=1085). Participants' age ranged from 18 to 91 years (M = 55.3). The majority of the participants were female (68.9%), and Caucasian (84.8%). Only 53.4% were currently employed. A total of 778 of the baseline participants continued with the study to the completion of the 18-month assessment, resulting in a 72% retention rate.

## Data Collection Methods

Participants were proactively recruited through the mail. Assessments were mailed to participants, which could be returned in a postage paid return envelope. If individuals did not return the assessment packet within two weeks, they received a telephone call and were able to complete the survey over the phone. The majority of participants (89%) completed the baseline assessment through the mail, 9% completed over the phone and 2% used a mixed mode. The same procedures were used at all assessment time points.

## Outcome Measures

The percentage of individuals in the action or maintenance stage of change was compared across time points for treatment and control groups. All individuals at baseline were in pre-action stages, indicating that they were not practicing effective stress management. Individuals who moved into the action or maintenance stages at follow-up had begun practicing effective stress management.

Intervention effects were also investigated by examining improvement over time on three continuous measures of targeted components of progression to action: stress and coping scores on the RISCI, scores on the Stress Management Behaviors Inventory, and the CES-D.

## Evaluation Methods

Random effects models

## Research Results

A random effects model indicated that the treatment group had significantly more individuals reporting effective stress management at follow-up time points than the control group. At the 18-month follow-up, a significantly larger proportion of the treatment group (62%) was effectively managing their stress when compared to the control group. Results also indicate that the intervention had significant effects on stress, depression and specific stress management behaviors.

## Barriers & Solutions

No adverse events or side effects were reported by any of the participants in the intervention or the control group.

## Product(s) Developed from This Research

The Pro-Change LifeStyle Management Program is a suite of interactive health behavior programs that addresses the most costly behavioral risks, including weight management, smoking cessation, stress management, depression prevention, exercise, and medication adherence. The program is based on the Transtheoretical Model of Behavior Change (Stages of Change Model), and includes the Health Risk Inventory (HRI) as well as the individual behavior programs. The HRI is a stage-based health risk assessment of readiness to change leading health risk behaviors and health care cost drivers. The HRI provides each user with stage-matched feedback on strategies they can use to change their behavior. The HRI also directs users to the most appropriate individual behavior programs for their specific needs. The individual behavior programs, including the stress management module, begin with an assessment which is used to generate individualized and stage-matched behavior change feedback and exercises based on empirically validated theory and decision rules. The user completes assessments at specific intervals, and is provided with both normative (compared to peers) and ipsative (compared to self) feedback based upon their stage of change, processes of change use, self-efficacy, and decisional balance responses. In addition, a stage based self-help manual is provided for each of the behavior programs, including stress management, to which the feedback reports refer. The program can be delivered interactively over the Internet, or through the mail and telephone.